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LOCATION/ENDROIT: Westin Harbor Castle, Toronto
PRINCIPAL(S)/PRINCIPAUX: Tom Rusnov, Canadian Co-Chair of the Electric System Working Group;
David Meyer, US Co-Chair of Electric Systems Working Group;
Alison Silverstein, Senior Energy Policy Advisor, Federal Energy Regulatory Commission;
Dave Hilt, NERC (North American Electric Reliability Council);
Gerry Cauley, MC;
Kim Warren, Manager, Control Room Operations at the IMO;
Tim Kucey, Market Analyst, National Energy Board, Calgary;
Frank Macedo, Hydro One;
Gary Bullock, Tennessee Valley Authority

SUBJECT/SUJET: The Electric System Investigation Team conducted a technical conference on December 16 in Philadelphia to receive input from the electric industry on how to prevent and minimize the impacts of possible future blackouts. A second conference will take place in Toronto on January 9, 2004, to solicit further input and address a number of issues in more depth. The conference will consist of four simultaneous "breakout sessions" in the morning to be followed by presentations to the assembly from each of the four groups in the afternoon. After each presentation, participants will be able to ask questions and offer further comments. The first session will be a review of the Philadelphia panel discussions: Review of the reliability coordination; emergency response; operating tools; planning, design and maintenance issues and protection and controls issues.

Tom Rusnov: God morning to you all and first of all, let me thank you sincerely for attending this conference. I am very pleased at the turnout. We've got over one hundred people who have registered for this conference and possibly a few walk-ins. So with that I'm very pleased. I was saying to some

folks I had two tremendous fears; one was that we have, us four and a few of the NERC people, IMO and Hydro One attending the conference and the other fear was that we have two hundred and fifty people show up which was going to be rather difficult for breakout sessions. I think we have a pretty good number to have a successful day.

My name is Tom Rusnov and I'm the Canadian Co-Chair of the Electricity System Working Group that's investigating the August 14th Blackout as you all know. Secondly I want to welcome all of you to Toronto; those who don't live here and especially those from far south. You've come at the first real cold spell that we've had in this part of the country. I looked at the TV this morning and the temperature was -21 with windchill, -25, for those of you, and these are degrees Celsius or centigrade as you call them in the States, and we're approaching -40. So you don't have to worry whether it's Celsius or Fahrenheit, -40 is exactly the same.

(Technical difficulty) and sincerely I want to thank (inaudible) for organizing this from Ottawa (inaudible), paying for lunch, a very important contribution and certainly for helping me tremendously in putting this (inaudible) together. I want to thank Gerry Cauley who has agreed to chair this. He also did the one in Philadelphia (inaudible). (Inaudible) views in a more intimate fashion on a one to one basis as much as possible and Gerry will explain the details more fully.

There's two things that I would like to emphasize with regard to the breakout sessions. One is that consensus is desirable but it's not necessary. Clearly if you reach consensus on a few items, there may be others which you feel you can't reach consensus on, so that's perfectly acceptable. We want to hear all of your views.

The second thing is that this is a technical conference and with it's purpose being, your suggestions on preventing or reducing the probability of another outage as I've just said. Neither this working group nor indeed the taskforce can solve all of the industry's problems and we don't expect to. There are political issues, there are issues related to the markets, etc. We can't deal with all of those issues today. We're here primarily to deal with those technical issues which we can address directly and that's what we're going to try to do. With the tremendous depth of experience and knowledge here at the industry, we really look forward to hearing your views and getting your help. Thank you very much and I hope you have a successful day. I'd like to turn to David.

David Meyer: Thank you Tom. I'm David Meyer. I'm one of the US Co-Chair's of the Electric System Working Group and I

too want to thank you for coming and I welcome your input. I, naturally we are interested in whatever comments you have on the interim report that we published in, on November 19, but the more important purpose of this meeting I think is to focus on recommendations going forward; what changes should be made in terms of reliability practices and standard institutions, things of that sort. So I look forward to this discussion and welcome your suggestions. Let me see if Alison, my co-chair.

Alison Silverstein: So many microphones, so little to say. I too am delighted to be here. I work for the Federal Energy Regulatory Commission of the United States and we know painfully well the complex international as well as technical issues that we are dealing with and we appreciate everyone's willingness to cooperate to assure that we all achieve the right outcome for the people whom we serve. It is, when our two government's established this taskforce of government representatives, we were fortunate that they created in addition, a working group of experts who would be available to give us advice and input and I'd like to introduce the three who are here today.

They are Mike Penstone (ph) of Hydro One. Stand up and wave. Do they all know you already? Dave Perry (ph) of NR Canada, where are you hiding? And Jo Ado (ph) of Delorance Berkley Last (ph) in the United States. Dave Perry, where are you? So I'm sorry, there are four and clearly the best of the best. Dave McFadden, are you hiding some where? Okay, only four. And so we look forward to learning with them, the input that you all have to offer us to create a really good set of technical recommendations that can help all of us keep outages like August 14th from happening again. So let the day begin, Dave Hilt, are you going to take us off a review?

Dave Hilt: Do you have anything else to say Gerry before I start?

Gerry Cauley: No.

Dave Hilt: All right. Good morning everyone and thank you all for coming on this very cold day here in Toronto as Tom was talking about. It's cold in the lobby and I haven't even been outside this morning so I know it must be cold outside. My name is Dave Hilt and I work for the North American Electric Reliability Council. Back on about August 16th, Mike Jen (ph) our President came in and asked me as the Director of Compliance if I would take the lead on doing the technical portion of the evaluation and investigation of the August 14th Blackout. Without even thinking I said yes. I probably should have thought about that before I said yes, before I determined how many hours and how

much work was involved with this.

We've put together a number of people to help us with it. It has been wonderful and I'd just like to acknowledge the three co-chairs sitting to my right. They have been, it's been a great team to work with in terms of putting together the report that you have seen, the interim report and as we continue to move forward to gather technical recommendations and determine what we need to do through these meetings as well as our own NERC meeting of trying to determine what recommendations need to go forward and how we prevent blackouts going forward in the future. Go ahead Gerry if you would please.

Just kind of reminders of what really happened, it's kind of like, I think it's like September the 11th, we kind of need to continue to remind ourselves what this event really looked like. The statistics from this event was it was reported of affecting approximately fifty million people in the US and Canada. That's a pretty large population that was suddenly, you know, without electricity. It was between sixty and sixty-five thousand megawatts of load that was initially interrupted on August 14th and that represents about eleven percent of the Eastern Ear (ph) Connection. The Eastern Ear Connection is of course the largest interconnection in North America and it's a huge amount of load.

We know there were over five hundred and thirty generating units that were interrupted, tripped off line during this event at something on the order of two hundred and sixty-one different generating plants. A very significant event in terms of what happened to some of the generators. We know that frequencies in certain parts of the system went extremely low and generators hung on for a very long time. Some other generators came off very quickly and so there's, you know, the team that's been looking into that is finding some very interesting things with that.

When the Santa Star Line, the 245 Line in Ohio tripped at about 4:06 p.m. Eastern time on August 14th, the black, that's where the blackout phase began to ramp up very quickly and from the time that line tripped in Ohio, there were some customers out in a local area at that time, probably primarily in the Akron, Ohio area but the blackout was essentially complete by 4:13 p.m. So that tells you how rapidly this thing expanded and when we finally got into the cascade, the highspeed cascade of this, which is what the folks here in Ontario saw, it was really, it lasted approximately twelve seconds. It was over very quickly; no real time for operators to intervene in that portion of it.

There are thousands and thousands of discreet events to take a look at. If you can imagine that many generating units to trip, each one of those units had events within the plant, you know, different control systems operating. You can imagine the number of transmission lines that

tripped, reclosed and the type of operation and actions that the team has had to sort through to determine what happened in this event.

And finally, I can't leave without talking about time stamping and the amount of time it took to sort through the number of events out there and looking at the, even in the hours leading up to the 4:06 time frame, it wasn't difficult but after 4:06 p.m., things became very, very critical. We were not looking at time in minutes or seconds; we were down into tenths and sometimes even hundredths of seconds to determine what happened in this blackout. And as people are trying to continue to model the dynamics of this event, it's been a real interesting process trying to sort out all of the varying time stamps and I think we need to do some work on that. Go ahead Gerry.

Just so you folks know, this being a technical conference, we organized our investigation, as I said, I didn't know what I was getting into but thank goodness for the industry volunteers and a lot of people that came together to help us with this blackout investigation; some of my team leads are here today. But our approach to investigating the blackout was we broke it apart into some logical areas of investigation based upon areas of technical expertise and so this is the perfect forum for discussing, you know, how we broke it out, how we approached the problem. And the team leads are here and they'll be among you, a number of my team leads are here, they'll be among you during the breakout sessions this afternoon or later this morning. And so I ask you, you know, I encourage you to talk with them, find out what they've observed from a technical standpoint but also give them your input because that's what they're looking for. Go ahead Gerry.

NERC took some immediate actions and as you've seen in the interim report, there were some basis for doing these things. We were interested and asked our members to assure these types of things were in order; looking at their voltage reactive management, ensuring that there was sufficient voltage support for reliable operations, communications among reliability coordinators and others if needed to implement their communications protocols and we'll talk about some of those things a little bit later, failures of system monitoring and control functions. You've heard of some of that that took place during this event, make sure that all of those things were up and running. Go ahead Gerry.

Emergency action plans, make sure people understand what an emergency looks like and what to do and how to train your operators for that, training, doing some serious training for emergencies and of course, the final one is vegetation management. You know, all of these things are just critical to ensuring that we don't have a blackout in the future. These were the first six kind of recommendations that NERC put out regarding what we need to

do to prevent the blackout from occurring again. Go ahead Gerry.

I thought I'd go back and share with you some of the things from some of the previous blackouts and you know, talk about some of the lessons that we've learned or haven't learned. And I just put some excerpts from the recommendations and the findings from some of the earlier blackouts beginning with the, kind of the one that started all of us on this path, at least with NERC, the November 9th, 1965 New York Blackout.

And we found some interesting words in that when you go back and you look at it, it said system control centres should be equipped with displays and recording equipment to give operators a clear picture of system conditions. You know, that seems pretty important. We need the tools, you know, the operators need the tools to do their jobs. We coordinated programs of automatic load shedding. Certainly those things would have been, you know, we need to look at that again, and through programs and schedules for operator training and retraining, rigorously administered. And so we need to, you know, you kind of look at that you say, uh, some of that sounds, those recommendations don't sound too far off for today. Go ahead Gerry.

We had another blackout in New York in 1977 on July 13th and again, the single most important cause of that blackout was of the system operator, failure of the system operator to take the necessary action. Again, training of system operators was a key thing and tools, you know, full scale simulators should be made available to provide operating personnel with hands on experience in dealing with emergencies. Go ahead Gerry.

We had another major outage, July 2nd, 1996 in the Western US. Some folks are here from the US so if you aren't familiar with that, you can ask them some questions as well. But what they found was we needed to review the need for security monitored, function to monitor operating conditions on a regional scale. You know, essentially looking at wide areas that you know, we can't look at just the control area anymore, we've got to look at bigger views. We need tools such as online power flow and stability programs and real-time data monitors and we need to review the current process for assessing the potential voltage instability and enhance operator training and operational tools. Go ahead Gerry.

August 10th, 1996, again, develop and periodically review a reactive margin. We need coordination among regional members with neighbouring systems. Develop communication systems and displays that give the operators immediate information on the changes of status of major components in neighbouring systems. Encourage operators to exercise their authority and train operators. Go ahead Gerry.

And if you haven't heard enough, certainly there's, you know, I found, when I went back and looked at some of the previous outages, I found some themes in that and I call it the three T's; Tools, Trees and Training. We need to make sure that all of those are in order to truly have a reliable system. As Tom said, what we're looking for today is forward-looking recommendations. You know, we're not wanting to go back and second guess what happened on August 14th and argue about what did, you know, who did or who didn't or you know, what happened here.

As Dave Meyer noted, certainly comments are welcome on the interim report. There's websites to make those comments if there's something you need to talk about on the interim report. Our focus here though is to look at what do we need to do going forward? New standards, processes, procedures, protocols that may be necessary, existing technologies that should be considered and implemented, new technologies that should be considered for implementation, changes in system planning, design, assessment in terms of things that we can do going forward.

And finally, what do we need to do with training operators. You know, we saw that in every one of the blackouts and how do we assure that operators are adequately trained and know how to take, know how and when to take actions out there. And finally, I think recommendations have to be implemented. If nothing else from my slide presentation, I hope we've all, in this room, learned that we have to follow up, we have to make sure that every one of these recommendations is implemented and we don't forget it.

Because it seems like every time that we have a blackout, we see some of the same themes coming up and I don't know whether our institutional memory is short or just what the issue is but certainly, I think we need to find ways to make sure that we don't forget the lessons that we've learned before and on August 14th. And I think that's it Gerry. Oh finally, in terms of standards, just a note that we have a new, you know, presently the standards that we operator to are, or our current operating policies and planning standards, NERC has a new standards process. It is an (inaudible) approved process. We're looking at how do we coordinate that with the standards organization here in Canada. But you know, do new standards need to be developed and in what areas. Go ahead Gerry.

And the agenda for today, just so you know who's going to be talking, you're going to hear from me again almost immediately. I'm going to talk a little bit about reliability coordination. One of my team leaders from BPA couldn't be here today so I'm going to cover that for Vicky

Vansant (ph). On emergency response, you're going to hear from Kim Warren here from the IMO; operational tools, Tim Kucey who's been one of my team leads in terms of the operational area and you're going to hear a little bit about operational tools from Tim.

Some of the things that we found at the December 16th workshops; planning design and maintenance issues, Frank Macedo here from Hydro One has been a team lead with that and he's going to talk about those issues and finally, protection and control issues, both transmission and generation and Gary Bullock and actually Bob Stewart, Tom Weedman (ph) is here as well; they were all team leads in those areas, are here to talk a little bit about what we heard at the December 16th workshop in Philadelphia. And finally as I said, the interim report is completed, it's available at NERC. You can also submit comments to the website at the DOE and I assume NRCAN has a site as well.

Finally, the final taskforce reports to be developed is going to include recommendations to prevent future blackouts; that's why we're here, to try to gather those and get that input from you folks. And so as Tom said, from our perspective and my perspective as well, this is your meeting. We're seeking that technical input here on recommendations.

Alison Silverstein: I would like to put in a (inaudible). If you leave here today and you come up with some more smart ideas and recommendations, we'd very much appreciate if you could get them into the NRCAN or DOE websites by preferably the end of the day on January 12th because we have to take all of your good input and put it together with everyone else's good ideas and make some coherent recommendations out of it and the clock is ticking. So January 12th is our goal for getting everybody's input. Thanks Gerry.

Gerry Cauley: And I've got the websites for that on one of my slides here. I just want to kick off the, for those of you who don't know me, my name is Gerry Cauley. I work with the North American Electric Reliability Council. One of the nice things about working with NERC is I get to come to Canada once in a while and I really appreciate the Canadians and some of the similarities and differences. One thing I've learned early on is that Canadians really take their hockey very seriously and I understand that the American Junior Hockey Team kicked some Canadian butt earlier this week.

(Laughter).

Gerry Cauley: I just wanted to make sure all fo the American's here

were aware of that. I experienced another difference this morning. I came down to search out the room and check out at the front desk and the front lobby, I don't know if any of you saw it, were down here early enough, was completely filled with black smoke and it was billowing and the front door, some kind of motor had caught on fire. And I was thinking, you know, the Canadians are a bit sensitive about being too American and they're very proud of, you know, things that are Canadian. I was thinking, you know, in the United States, if we had that much smoke in the lobby, they'd have rang all the bells and everyone would have evacuated the entire hotel and we'd all be standing outside in the cold. But I figured, you know, this is Canadian, it's like eh, it's cold outside eh? And it's only the front door that's burning down, eh?

But I am glad to be here, it's nice to come here, especially in January. But we're going to start this morning with a short panel and my objective is to try and get us to the breakouts as quickly as possible and that's a hint to our speakers this morning to just keep it brief. Cause the main work is going to take place in the breakouts today. The introductory panel presentations here are meant to recap what was covered on December 16th in Philadelphia. We had some very good sessions there, very good presentations. It was a different format but we had a lot of good ideas put on the table for recommendations and I've asked the presenters to give us a brief synopsis of where we're at.

I would mention logistically where we're going to go. The first panel is on reliability coordination. The first panel is on reliability coordination, so that's sort of the operational and communication stuff, operators and reliability coordinators talking to each other and dealing with system conditions will be in pier three. And the reason I'm telling you all this is because you get to select where you go on a breakout. So be thinking about where you want to go and you'll hear some of the presentations and maybe that'll help you decide where you want to go. Control centres and operators, this is more the tools, displays, systems, state estimation, real-time contingency analysis, that kind of stuff will be in pier six.

So pier three is around, way down the hall that way and pier six, seven and eight are around on this side, in this direction down here. So pier six will be first and then seven and eight are on the end. The third breakout will be related to assets and system designs with more planning and design types of things and then the fourth one is on technology. We're really looking there at system protection and controls, generator protection, transmission protections, remedial action schemes, things like that that could minimize or prevent cascading outages. That will be in pier eight which is the furthest room around the hall to the right.

We'll have the panel presentations, we'll do the four breakouts beginning around 10:00 or 10:30, as soon as we can get out to them. We'll work in the breakouts up until 12:30 at which time we'll take a lunch break for forty-five minutes. We'll come back in, each of the panels, each of the breakout groups is going to come back here and present the summary results. So you've got some work to do in the breakout. We want you to come back with a Word document or a Power Point presentation with some bullets just to present some of the recommendations of how your group would offer solutions to prevent future blackouts or to minimize the impact of future blackouts. We'll have those reports then after lunch.

We do want to refrain from talking about anti-trust issues. What is anti-trust? That means we're not going to talk about individual companies, market share, sanctions against individual companies. So you're better off talking generically about things the industry can do rather than specific actions against individual companies. We will focus on technical issues as Dave said and we'll have opportunities this morning and this afternoon for your participation and the, next slide.

There will be a transcript of the plenary sessions this morning and this afternoon's plenary session. In the breakouts, there will not be a transcription but each breakout group is asked to chose somebody to be the recorder to take those bullet notes that you will then bring back to the plenary session this afternoon. As Alison mentioned, there are the websites in case you have written comments and the deadline is Monday on the 12th. So if you have anything you'd like to submit to the US or Canadian Government sites there, particularly recommendations going forward and any comments you have on the interim report that was published on November 19th.

The rest rooms in case you haven't found them are down this way to the right between here and the other breakout rooms and lunch will be, you know, that's one thing I failed to do is figure out where lunch is but we'll get the information. It's in this area here, one of the rooms on this level. I think that's it. So with that I'm going to, we'll start with the first presentation which is Dave Hilt. He's going to talk about reliability coordination.

Dave Hilt: Thank you Gerry. For those of you who don't know, I guess a little of my background, in one of my previous lives I worked developing the reliability coordination centre at the main coordination centre in Chicago for the main region so at least I can talk about it intelligently a little bit I suppose. Next slide Gerry.

I went through the, when I looked at the transcripts and went through the presentations and the material from the December 16th conference, I identified a number of issues that I put up as single bullets here that were related to reliability coordination that came out of the discussions at that conference. And they related to things like wide area oversight, of course their tools, authority and delegation, responsibilities, communications, emergency recognition and actions, training and drills, their focus in the new world, you know, making sure they're focused on reliability and operational planning, you know, looking at how we plan for coming operations. Next slide please.

I just thought I'd go through these a little bit and just kind of expand on them slightly without getting into tremendous detail on what was said. But in the wide area oversight, the panellists that were there that day and many of the questions said that we must, you know, there was a need to monitor all transmission facilities in real-time within their footprint certainly and that the size and number of control areas is not an issue if properly implemented. But with the complex geographic lines that we have with reliability coordinators out there that you know, they're not necessarily electrically, I guess would make sense, with the electrical boundaries if you would call them that, within the systems they develop for other reasons around other issues. But there was a belief, there was a general belief by the panellists and I think the discussion there that monitoring in the surrounding area was necessary and monitoring in all facilities that can affect your operational area and monitoring that in real-time.

So essentially you're, what they're belief was, that a reliability coordinator, to have the appropriate operational view of the system needed to not only monitor what's in their footprint but monitor anything in the surrounding areas that can have a material impact on the operation of facilities within their system. And there was also a discussion of the need to do that just to provide some redundancy in operational oversight, views of the system and that that provided lines of defence for failures, failures to recognize and take actions, failures of hardware, etc. Next slide please Gerry.

In terms of system monitoring tools, I'm not going to go into that very much. Tim Kucey's going to cover that in a little bit but I will just add one thing that was the key theme of the people talking about reliability coordination. They said accurate state estimation and contingency analysis was absolutely necessary and that it should run automatically, at least every few minutes and not in terms of run whenever you feel you need to run a state estimation contingency analysis solution, and it should include, and these tools should include all of the critical facilities in both the RFC, the (inaudible) coordinator's area and his surrounding, and all of the surrounding areas as we

mentioned before.

In terms of authority and delegation, it was a pretty good discussion on that there. The comment was that the reliability coordinator need to have the ultimate authority. We have to have clear lines of who has the ultimate authority and responsibility and they believe that the reliability coordinator has that. Certainly control areas are the first line of defence but the reliability coordinator had the ultimate authority to make calls when they saw the need to do that and there was an obligation by the operational entities within that reliability coordinator's area to implement the directives and question them later.

In terms of delegation and delegation of some of their responsibilities, this issue has come up. It was certainly raised during the black out and there was some discussions about, at this conference and generally I think what we saw was they believed interconnect system reliability functions should not be shared or divided among our (inaudible) and their members. There needed to be a single entity that was responsible for making sure that these things happen and that a wide area overview must be provided by a single reliability coordinator for it's area. You can't just take small views and say I'm going to aggregate each, and I'll just aggregate all of these and assume that's a wide area view.

Communications obviously was key. On August 14th there was some notice, some people in the audience as well as the panellists noted that the communications seemed to be bilateral communications. They were not very effective to identify and manage the emergency situation and that there needed to be effective communication under normal emergency conditions and you need to have those protocols, internal protocols, external protocols, all laid out in advance as to how you're going to do the communications and timely communications with all entities and it needed to be very, very prompt and you needed to have all calls and those kinds of things, if there were some questions about what was going on, on the system.

But there's also two types of communications. First is the operator communication. Second is the communication of data and information among reliability coordinators and they believe that certainly reliability coordinators need to be exchanging scheduled outages, you know, in advance, they need real-time equipment status that you know, what's the status of all the equipment on the system, not only in their footprint but in neighbouring footprints and finally, they need to have real-time operational data; not just status but values so that they can run state information and contingency analysis on a wide area. Next slide Gerry.

Emergency recognition and actions. This ties very much into the next item of discussion but certainly, in terms of training, but there needs to be some emergency preparedness within a reliability coordination, knowing and understanding the actions that are, and protocols that are necessary in emergency situations, that they need to be worked out in advance with all of the operational entities so that you know who's in charge, who's going to take action, what they're going to do and they should be explicit as to what actions are going to be taken by who and when. And those were some of the themes that we heard again, at this December workshop.

One of the other notes that we put up there was there was some discussion about the working relationships, that in the past, many of the working relationships developed over long periods of time as people operated with, you know, operators worked with each other over years and years and years. As the industries change, we have a lot of new relationships out there and a lot of new operators and some of that, those working relationships aren't there and there was even a suggestion that we allow time for reliability coordinators and others to visit other operational centres and essentially become familiar with the people who are operating in those other centres so that they develop those working relationships. Go ahead Gerry.

Training and emergency drills. Well we really need to strengthen operator training and readiness. I think we've seen that in every one of the blackouts and there was some discussion of the need to have simulator training, specifically simulating emergency situations and operators responses to those situations; routinely performing system contingency drills so that they can look at that and determine whether and how to recover from unplanned events and also, you know, related with this, I guess the working relationships that have developed is there was a note on the lack of seasoned operators and that again, the changes of people within the industry, we have a broader spectrum of people with different responsibilities and there's operators in all of these facilities.

And so we've increased the number of operators, a lot of new people, a lot of new operators in the industry again. The level of how well these operators become seasoned is just not there so it ties into the training issue. And then finally, we need to determine how to train operators to have an inquisitive mentality. You know, if something doesn't look and feel right, you need to be pursuing it pretty hard and I think that came out in our discussions.

Finally, well also the focus on reliability. Some of the reliability coordinators may be spending too much time being either focused on commercial issues, assuring that the market's not injured, that you know, everyone is treated fairly. While those are very, very important that they need to

be addressed, the focus of the reliability coordinator needs to be on reliability; that was the discussion, and dedicated personnel focused on the system status. There need to be some people who are just literally dedicated to that side of the business, performing operational analysis, doing the real time monitoring. The operational planning issues, clearly rigorous operational planning studies daily, weekly, longer term.

There was a discussion that we need to have peer reviews of those operational studies. They don't just need to stay internal to your own, to the single reliability coordinator that's there. They need to be shared with the other reliability coordinators so they can question what each one is finding in their analysis for the operational studies for the day or for the week. They also need to be shared widely among all the other operational entities within the area, control areas and others to look for, simply to increase the awareness of any developing situations, things that may look to be at risk today.

And those operational planning studies as you go through the day then need to be verified along with your real-time operational tools, your state estimation contingency analysis tools to say are we still within what we thought our day was going to look like, are we still operating within those bounds and the operators need to keep track of that. I think those were the key issues that came out from the December 16th conference on reliability coordination.

Gerry Cauley: Okay, the second panel that we had in Philadelphia was on emergency response, recognizing and responding to emergencies and Kim Warren is going to address that one and you can take this mike up there.

Kim Warren: I gather everybody can hear me okay? My name is Kim Warren. I'm the Manager of Control Room Operations at the IMO and myself and Vicky Vanzan (ph) from (inaudible) Power were the two panel members at the December 16th conference on emergency response and I'm here just to give you a few of the highlights. There were, sorry if I've got my back to a few people, sorry. There were a few common themes at the conference between the two panel members and also it seemed to be from the audience itself. Those were on competency of the operational staff, the communications and procedures and processes, some of the tools and then later on in the panel simulation drills and tests and I'm going to go into the four of those now in a little bit more detail.

Along the lines of operational competency, what we

found was that it started, there are some overlaps here obviously with what Dave was discussing. The idea of creative, flexible, inquisitive minds and such starts right with the hiring processes and it's not necessarily just the operation staff, but it's also those staff that support them. Everything from those that do the studies and the planning, the procedure writers and such. So it's not just operations, real-time stuff we're discussing here.

Obviously the development of these staff through time is of paramount importance. There was some discussion about the cost associated with this development or training and there was some views in the room frankly that training was a bit of a burden and then there was other views within the room itself that basically said that training was more of an investment and the staff themselves were assets that you had to treat accordingly. There was issues around, you have to know who you're dealing with. The clear lines of authority, roles and accountabilities have to be well defined and well understood by all parties, not just by those exercising them, but by those receiving so that the actual actions that occur bear some relationship to what's expected.

The operating guides and strategies that are being used must be flexible enough to handle multiple situations but very robust in nature to actually be able to affect the control actions that you're trying to implement. In other words, wide ranging, being able to multiple task, but be able to ensure that you achieve desired results in a timely fashion. Understanding and implementing these control actions is obviously very important. Cause and effect. Do you realize what you're asking people to do? Is it within their capabilities? Are they able to turn around and do the actions you're requesting and give you the relief required so that you could actually address the situation at hand without making situations worse. And then obviously the empowerment of the authority and the resources, not necessarily ensuring that people have the obligation to do something, but they actually carry it out.

As far as communications and procedures and Dave also touched on this, obviously the relationship between one operational entity such as an RC and his neighbouring RC to make sure that we're exercising the tools and procedures and such that are in place such as the RCIS type systems and also within a control area, or sorry, within an RC footprint, how that information is disseminated to, well I was going to say marked participants but within the operating authorities within that network is of paramount importance. You need well defined, established procedures that are already in place and refined as necessary to ensure obviously you get to your required relief.

There was some discussion around transmission motor

relief procedures and the fact that there seems to be too much of a reliance on the TLR procedures for real-time limit violation concerns. The concern here is that it is an effective way to equitably manage congestion but it is not effective to manage the limit violations that require repreparation or rebalancing of your system in a timely fashion. It's too slow.

There's a need for operational staff to be able to determine when the scope of coverage or when the parameters of their limits are no longer valid. And this is where we talked about the need to have operational staff trained, just not operators. There has to be a relationship here between the two. So that during the wee hours of the morning, operation staff understand when the information is being presented to them, may not be valid. They may have to rebalance, redispatch, reconfigure the system and if necessary, shed load to maintain a stable and reliable power system.

There was a reluctance by some at the conference it appeared to use load shedding as an effective tool to manage the interconnection reliability limit concerns. Some entities have it in their procedures, some entities have exercised it and exercised it more than once for the best interest of the interconnections, some entities seem to be reluctant to be able to do that and they talked about an operator mentality, bla, bla, bla that they try to always ensure to have the lights on and such. And then there was some discussion about the fact that frankly the operational staff will exercise processes based on direction from their management. So although we were talking about the operational staff, we tried to slap that back in and say, potentially the issue isn't the operational staff, it's those who supervise them. Thank you.

As far as tools, yes you're hearing sort of overwhelming sort of theme here but the fact that you must have intimate knowledge and monitoring and such about your own system but also this wide area of perspective. The idea here of EMS (inaudible) criteria and what we're discussing there is or potentially that might not be the right words but what we're trying to get across here is the point that your EMS platforms, day estimation and the like, has to have an acceptable level of performance in the range of say ninety-nine point five or ninety-nine point eight percent reliability.

But not only that is when those tools are down for whatever reason, you have to have procedures and processes in place because the accountability for reliability is still with you, you still have to carry out the function even though the tool may be down. It may not be fair, it may be very difficult but as such, you still have to carry out the tasks. We talked about high reliability for tools that feed these processes; phone systems, some of your background hardware and such that are required to actually augment the

reliability aspects. Talks of voltage collapse monitoring here but we're really talking about all types of monitoring; thermal monitoring, voltage, stability, voltage stability both in a precontingency phase and in a post contingency or what if phase. That information has to be coming towards the operators in a fashion that they can readily use.

And then we talked about, and this is just an example here but there potentially is a need for increased accuracy in some of the tools. The tools now are populated on a regular fashion but perhaps the rates of what that information is received should be reviewed and where some things now require to be updated once a day, maybe it should be more like once every fifteen minute or once every hour, once every five minutes, depending on the application.

There's also the concept here where we talked in Philly about reserves, system reserves versus area reserves and some regions do this, particularly the northeast, and some do not. And the concept of area reserve is the area that you may be able to cover for your largest single contingency of say a thousand megawatt units but say you have multiple five hundred megawatt units in other areas or other locations within the area of your responsibility, you've got to be able to ensure you can move energy through your system to cover off for single element contingencies. So your worst contingency may not be your largest contingency as far as reliability issues.

And then finally, or at least I think it's finally, yes it is. Finally, along the idea of simulation and drills, what we talked about here earlier was training is an investment and the best way to manage these issues in the first place is to ensure that they never happen. And it's the concept of prevent, contain or minimize system disturbances. Certainly drills help to identify the unexpected and the more realistic you can make these drills, simulations and tests, the greater or the more success you're likely to have during a real-time event. And their taxing, they should be a stretch for your staff . They should go top to bottom so you're exercising all areas of emergency response within your organizations, not just your operations staff. They need to be difficult enough to bring that reality in play. You need to ensure that if you do have gaps that they're addressed, that they're followed up and then they're retested.

So the post analysis, just having a successful drill achieved is only part of the equation. There has to be a significant analysis that's done after the fact and such. Make sure the lessons learned actually get learned. You know, there may be things that you do and you do quite well during an exercise or a drill but if they're not well documented, if they're not proceduralized, if they're not, if you don't continue that training aspect with your staff, they will be forgotten. So you could be very, very successful in your

simulations and three years from now or four years from now or ten years from now if you ever have another major upset, you may find that you're starting to have weaknesses in areas where you thought were your strengths.

We believe that third party type expert audits were a requirement. Bring in staff from outside organizations from time to time to look at your drills and exercises, to make sure that you're actually achieving their expectations of you. And the last thing is to carry out different types of simulations and exercises. We're not just talking about simple circuit restorations but it could be the return of outside potential (inaudible) sites, it could be voltage reduction tests, it could be emergency load shedding tests, it could be control room delays, control rotational load shedding tests. We exercise all of those here and we do it at multiple times of the year with no notice, we do it with all operational staff and if we find problems or procedural issues and such , we repeat them and we do this continually.

It's important, if at all possible if you can get into the mindset of your staff, that it's okay to ask questions. It's okay to say I don't understand or I need clarification. You talk about inquisitive staff and creative staff and whatever. They've got to also be somewhat thick skinned. It's okay for them frankly to put up their hand and say I need you to say that again, I need you to repeat that again, could we go back and go over that again, and there's nothing wrong with that. Matter of fact, that's something that we try to promote to make sure there is full and complete understanding. That's all I had.

Gerry Cauley: Thanks Kim. If you are interested in the topics that you heard from Dave Hilt or Kim Warren, that will be the first breakout and that'll be in pier three which is the only one that's back down this way. So those sort of operational types of issues, operator capabilities, training, reliability coordinators and what their jobs and authorities are, that'll be in the first breakout and Kim will be facilitating that. Now we're going to move to operating tools and Tim Kucey is going to cover that and that will be tied to breakout session two.

Tim Kucey:

Good morning. My name is Tim Kucey. I'm a Market Analyst with the National Energy Board in Calgary, Alberta and you're probably wondering, how does that make be anything of an expert on EMS and tools? Prior to joining the board back a couple of years ago, I spent about ten years in the utility industry in Alberta with Trans Alta Utilities with their (inaudible) operations, industrial marketing, etc.; then left the power industry and moved to the oil and gas industry with distributor control systems, Fisher Rosemount and Moore Process Automation. From there I moved to work with General Electric for some time on their (inaudible) automation products, their (inaudible) to use

and that. So it was kind of a pure coincidence really that I got involved with the overall team here and I ended up becoming the co-team lead of the (inaudible) operations EMS team that Dave showed on the chart there along with Vicky Vanzan from VPA.

Around tools, I guess the other thing I should mention is that I personally wasn't able to attend the Philadelphia sessions so I'm working off the basis of what I saw in the transcripts as well as the presentations there. However, given the amount of time and work that I've spent looking at tools since the outage as part of the team thing, hopefully I'll be able to help what's going on here and answer any questions you might have eventually in our breakout session.

One of the first things I'd like to point out about tools specifically is the observation in the interim report that the failure or failings of the tools predominantly due to lack of redundancy or backups. In this outage, this is the first time instance of this kind of element as being a factor in the overall outage. If you look at what happened in previous outages, the issues that came up, trees, training, those types of thing appeared again in the August 14 outage. But actual failures of tools was, this is a new thing that happened this time around. And what it really indicates I think is that tools have a new prominence as a player in the reliability issue. So they need a bit more of our attention and focus to determine what we need to do in that area for the future.

Overall, just to briefly look at what happened in Philadelphia, there was a relatively light discussion I'd characterize it, about tools in Philadelphia because they're sort of a thing that deals with all of the other things that have been talked about; training, the preparedness, the procedures, etc. However, the one thing that did come out very strongly was that they must be available and used. And of course, the actual tools that were in question that were considered were the usual suspects I'll call them of EMS (inaudible) contingency analysis tools, state estimator and also flowchart monitoring tools. However, there was also a very strong recognition that no matter how goog of tools you have, they cannot replace that inquisitive and well trained operator. So their an assistance, not a replacement.

One of the issues that was mentioned in Philadelphia was the need to train operators on how to use and interpret the results from those tools, specifically what's there and at times, what's missing from that tools output. Another issues was of course backup, redundancy, how do we make sure that tools are there consistently? An interesting one of the tools that got mentioned was the phone as one of the most relied upon tools even though there's clear recognition that it less than the most desirable tool for the type of

work that it's being used for or the type of function that it's providing.

There was some comments about evolution and implementation of some very large state estimators very recently after post August 14th. PJM is putting in a ten thousand buck state estimator. (Inaudible) reported that they had put in a state estimator that is thirty thousand busses, and the fact that they had very strong contingency analysis tools that were now linked to them. However that's lead to comments and possibly concerns of the links between the real world gathering systems and these tools. Is what's coming out of that real world tool into these other tools, accurate and is it timely? Is it too stale as an input?

And lastly, one of the things that got discussed and sort of thrown into the air at Philadelphia was the whole issue of (inaudible). I'm sure if you've read the report, one of the issues that was in there was at First Energy in Ohio, their control centre does not have a (inaudible) and it's an issue that was discussed and some comments made about it and we'll talk hopefully more about that in our breakout session. But as I said, I was unable to personally attend the Philadelphia session. Here's what I've read from the transcripts and from the presentations that were there and I look forward to meeting and talking to any of you who want to meet with me later. Thank you.

Gerry Cauley: Thanks Tim. So Tim will be heading the, facilitating the breakout on control centre tool systems, data, modelling, those kinds of things and that'll be in pier six down this way. And Frank Macedo, Hydro One is going to talk about the next topic of planning and design.

Frank Macedo: Thank you Gerry and good morning. If you could put the first slide up. There was a lot of ground covered in Philly on the planning area and what I'm going to do is have to go through this very quickly but there'll be plenty of opportunity in the breakout sessions to explore and expand on these issues and no doubt discuss other issues. Go to the next slide. (Inaudible) among you will notice sequence of issues here. Next one.

Though there was some discussion of facility ratings and as you know, in the Ohio situation, the facility ratings played a large part. Various methods are used to calculate the sag of conductors and various assumptions are used, particularly in regard to environmental conditions, temperature and particularly wind speed. There's a need to develop, established policies, procedures to calculate appropriately the conductor sag, enhance (inaudible). There are methods available to actually monitor in real time, the sag and in fact, the clearance of conductors and these can act as a warning system for the operators.

And the other issue that came up was the need to establish consistency of ratings through planning to operations. And equally importantly, if changes are made to the ratings of facilities, then these ratings must be communicated promptly to all the entities that's required, that use these ratings. Next one please.

Now in addition to facility ratings, there is a need for improvements in modelling and the three key areas are listed up there. Low power factor, we all know, those who have done these studies and those who are involved in devoting limits and so on know that power factor needs improvement. We tend to make assumptions and very seldom do we actually go out and check to see that in fact our sums are valid.

Load representation is clearly a very important thing, particularly the voltage stability and voltage collapse type of studies. And finally the generator reactive capability. We've got to make sure that the numbers of the capabilities that they use for reactive capability of units is in fact achievable on the system. Now there are standards available, there are NERC standards that require testing of generators but I don't believe that they are widely applied. Once you do the studies, you should periodically check that in fact the studies are correct and there was a discussion of the need for benchmarking (inaudible) studies.

And in order to help the benchmarking, we should consider judicially located process and (inaudible) recorders. These would help not only benchmarking but also in doing a postmortem analysis of disturbances. In Ontario about two years ago, we put in some disturbance recorders that are time synchronized and those have proved invaluable in this investigation and there's a proposal that these should be widely deployed across the Eastern Interconnection so that next time, hopefully we don't have one but if we do, it'd be a lot easier to do the analysis. Next slide please.

Now there's no substitute in being prepared and the best way of being prepared is to carry out four sets of sensitivity studies. The criteria requires us to do studies beyond normal contingencies, not just to N -1 but to N -2 and go even beyond that. This helps to define the robustness and resiliency of the system.
And when these studies are done, it's equally important to communicate the results of these studies to all people who need to know.

In carrying out inter-regional, regional and controlled area studies, we must really stress the system and we've got to look at simultaneous transactions across a wide area and use both forecasted and historical transactions to guide us in this. And again, when these studies indicate

there are problems, we've got to communicate these again to all affected parties. Therefore there was a proposal that there should be a peer review of studies. If one controlled area does a set of studies, there is a good case to be made to have those studies reviewed by neighbouring control areas so they understand the issues and they are prepared, should conditions in one controlled area affect another and vice versa and those will provide checks and balances. Next one please.

Reactive power planning has devoted a lot of our time in the investigation and I just want to make a few points here that to me are extremely important. The first one is that the voltage magnitude alone are poor indicators of proximity to voltage collapse. You may be operating at a voltage that looks pretty good but in fact, may be very close to the point of collapse. We need to do more analysis, in fact, in a PV, VQ analysis to determine what the minimum voltages are at critical busses and ensure that we maintain those minimum voltages.

One way to do that is to ensure that we have adequate reactor reserves in local areas to meet those minimum voltage requirements and to respond to contingencies. The proposal that is put forward was perhaps with need to monitor the reactor reserves on the system and this would ensure that the reactor reserves are met. And if the reactor reserves are not adequate, then operating measures must be put in place including load shedding if required. Next please.

Now the planning and operating criteria allow for manual adjustments following a contingency to prepare for the next contingency. In fact, the planning criteria, table one, category three of the planning criteria and operating policy two allowed this to take place. However, and generally you do this in the operating planning time frame but the measures that are relied upon to carry out that adjustment must be identified, must be shown to be feasible and must be communicated. If these measures are not available, are not feasible or cannot be done in a certain, within thirty minutes, then the system must be operated to withstand the N -2 contingency. Now in at NBCC we do have a high risk condition and the proposal was made that this should be expanded so that others recognize high risk conditions and put the system in a safe posture, more conservative mode of operation.

At the conference in Philly, a proposal was made that there should be two types of standards. One set of standards would be prescriptive, not negotiable, that these would focus on reliability and there would be a few of those standards. And then there should be another group of standards that are more sort of objective based. These would say, describe what you expect to achieve from these standards or from these type of

standards.

Again, a proposal was made that we should be monitoring, identifying and monitoring measures that would provide a heads up on deteriorating reliability so that you can start to take action when you've got time to do it. And finally, that, and I think we heard this earlier today, that there's a need to strengthen the compliance audit process, move away from reviewing documentation and getting more into policies, practices, performance of individual entities.

And finally and again we heard this earlier today, you know, we've had a number of blackouts in the past and a number of recommendations, we must this time have a managed process to ensure that those recommendations are implemented. And here I'm talking about who, what, by when with a monitoring process to ensure that who, what, by when is actually being achieved. Thank you.

Gerry Cauley: And if you're interested in those topics, Frank will be facilitating the breakout session in peer seven. And the final presentation is Gary Bullock who's the Generator Performance Team Leader on the Investigation team and he's going to talk about technologies and protection and controls.

Gary Bullock: Good morning. I am Gary Bullock. I work with Tennessee Valley Authority in Tennessee obviously. I am the leader of the Generation Performance Team and I will co-facilitate the breakout session as Gerry described it with my associate, Tom Weedman who is the leader of the performance for transmission. The technical conference held in Philadelphia, there were several panellists, next slide please, several panellists that were addressing and to promote the discussions as published, there were six questions that were proposed to the panellists and to the audience.

The first of these was the, effectively the ability to limit the scope of the blackout. As everyone is aware, this blackout event started with local conditions at an area in Ohio. It then expanded to an enormously large area and somewhat quickly as David had pointed out previously. A second question related to prompt discussion was the adequacy of the transmission line protection itself, talking to the technical details of the types of protection and the operations that occurred. A third question that was posed was the adequacy of the generation unit protection and did it contribute to or was it possible to limit the scope of the cascade after it got started based on the performance of those protection schemes.

A fourth question related to the discussion was the

performance of automatic load shedding and the emphasis there of being on, was it adequate, is there enhancements, is there coordination issues and they included both frequency sensitive devices as well as voltage sensitive devices. A fifth question was for the opportunities for new technology in particular in addressing the areas of protection, the control and operation of the units and transmission system itself and also a bullet to or a question directed toward the quality of diagnostic data that was available to analyse both in real time as well as after the fact.

The panel presenters, there were five presenters on the panel that were invited to speak and to promote the opportunity for even the audience to participate. They were Carson Taylor from BPA, Phil Tatro (ph) from National Grid, Chris (inaudible) represented an interesting observation from OSI, Tom Weedman, my associate that will co-facilitate the breakout session today formerly of (inaudible) now presently retired, and Gary Bullock, myself from TVA. As far as audience participants, there was one participant that, this was the very last session, it was a wrap up. A lot of people had already made comments from the different presenters but Frank Macedo had a particular question related to frequency response and the ability to monitor the system with possibly the new technologies.

The questions that were posed, I present the material not in sequence of presentation but in these groups of the questions. First of all, under the ability to limit the scope of the blackout, among the panellists and participants from the audience, compliance with third planning standards was the theme. In particular, planning standards two and three that were presented. Carson Taylor had a lot to say about that and so did audience participants. These of course were approved after the '96 power failures in the west and were approved in '97 by NERC.

2C S1 related to automatic voltage regulation, there was an issue related to the fact that it allows an exception based on the approval of the transmission system operator and it might be there was too many exceptions of those nature. S2 and G2 both relate to the maintenance of the system voltage, that is the generators in the system shall be operated to maintain a required system voltage and have additional reactive capability after maintaining that voltage to respond to emergencies. That's in the standard. The S4 under the same 3C section relates to voltage regulation controls. They should be coordinated with the generations ability to withstand short term duration of interruptions. These are all existing standards along with, in section 2B S1, the requirement for generating testing to validate modelling, consistency with actual characteristics of the unit.

Comments made by some of the panellists indicate

that there's a reluctance on some operators to actually do these testing. The reluctance comes from such things as, they've done the testing, they've attempted to do the testing and units were actually tripped off as part of the test. And it was pointed out from some of the panellists that that actually indicates a shortcoming, that you had something that was even observed in this event on August 14th where (inaudible) systems tripped in unusual patterns that were not expected because that was an unknown region for the operation of the unit which would have come forward if the unit had been tested in that nature.

And the last, the planning standard that was referenced was 3A G17 which is avoid the possibility of overly sensitive zone 3 relay operations on transmission protection which was a key element theme throughout that you'll see me repeat again here. Also in the area of the ability with existing systems and what was in place at the time to limit the scope of the blackout was the application of special protection schemes or wide area control systems, controls.

It was mentioned that these had been successfully applied in certain prescribed areas of North America and in the west there's a particular mode of protection that is very successful and imported for protection in that area. And in the extreme northeast there is a special protection scheme that actually operated in this event probably erroneously. And then there was presentations in even earlier panels about operations of such schemes in Florida.

These, as was pointed out by Mr. Taylor, in fact that the, in what he described as a meshed system, this is particularly complicated. Determination for doing a controlled separation that actually makes sense and does merit as opposed to maybe adds to the problem. So this needs to be addressed carefully, but it was an opportunity perhaps that could have been applied here. And also to learn from history and to act on it, that was a theme that you've heard from the other people presenting this morning. Previous blackouts, we seem to be repeating ourselves, we haven't learned from this history.

But there was also a discussion, the next interruption, the next cascade or next failure or blackout, wherever it's going to be, it will have some of these same common themes in it. You'll see these things again. However, in this event, we've saw things that we've never seen before. Tim Kucey mentioned something about the importance and failure of EMS tools and I've seen for the first time both in this and as well as a blackout, the European Blackout in Italy where there was an under-frequency operation of units that it was apparent that we've not perhaps seen before. So there will be something

different with the next one. There will be one and we need to be prepared for the unexpected. Next slide please.

In the, addressing the question of transmission adequacy, transmission line protection adequacy, the common themes that I saw there from being a participant there as well as the notes that I've read and incidentally in the transcript, it's available off the internet as well as the discussion presenting material, it's available also from the website. And the transcript, this section begins on page 224. It's a very long transcript if you go to read through it, a lot of information there though. The three themes that I post here are to avoid or eliminate the use of zone three back up relay schemes as a back up protection for breaker failure and other schemes. This also included a proposal that you eliminate generator back up protection and that you go with more modern, dependable relay protection schemes that are available now with the current technology.

A second theme there was to modernize protection systems and equipment in general. There is a different vintage of control systems as well as protection schemes and there's opportunity now. These are, these have a cost but they're a low cost compared to other alternatives in the system that require building new transmission lines to generating units or new technologies for reactor devices. And this is kind of a low hanging fruit that seemed to be identified. And the last one, there was a theme there, just repeated, eliminate clearance problems so that your transmission lines and your protection schemes are all coordinated with the capability of the system itself.

With respect to the adequacy of generation units, three common themes there that came from the panellists in the discussions, a need to coordinate voltage control. There was a presentation of material which indicated that different units within regions were being stressed to the limit of execution or capability in terms of reactive output. They were at their limit, they've been at their limit for extended periods of time and it seemed to be common practice.

There were other units that were not participating in that mode, they were not on automatic voltage control as the standard would say because they had gotten their exception and they were on power factor, essentially on one hundred percent power factor, and that didn't necessarily stay coordinated. There was differences in profiles and voltage from the system and the unit requirements for voltage support. And there were units that were prescribed a voltage schedule yet they were not able to maintain that voltage schedule and push to the limit. In fact some of the precursors to the vent such as East Lake Five (ph) were possibly a result of the stresses associated with that reactive operation of the units.

A second bullet there is to modernize older equipment. Carson and others addressed the issue that there's a great number of older vintage units on the system but there is opportunities to modernize both their control and their (inaudible) systems or protection schemes. A third bullet is to revise protection. Assume in a blackout, as we pointed out earlier, we need to learn to expect the unexpected. There tends to be a systematic approach towards generation protection that assumes that the transmission system is going to be healthy and normal and I'm protecting my unit from some local event versus what's this going to do when you actually encounter a blackout circumstance like we saw.

This contributed I think to the operation of some large units in the Detroit area and to an extremely low frequency. We're talking like twenty-three hertz. That material is in the, available off the internet if you want to take a look at some of that information, which related to the fact that there were assumptions made in the protection scheme that didn't account for (inaudible) synchronous operation or the voltage being down in the fifty percent level, you know, when the unit was trying to be tripped off and so forth.

Performance of automated load shedding. There was an acknowledgement that of course, under-frequency load shedding was in place. It was put in place after the '65 blackout. It was universally applied. It operated only after the islanding. It did not come into play during the parts of the cascade where things could have been avoided. It only occurred after the islanding occurred and the frequencies, and the local islands collapsed. It was ineffective in limiting the cascade. In other words, it's a general feeling there and it either over or under tripped. It either tripped too much and frequency went to high or it tripped too little or there wasn't enough of it available and so there was a tendency to believe that there is a need for readdressing that within the regions, coordination of the under-frequency operation, where the understanding that there'll be islands of operation as opposed to just the Eastern Interconnect total pulling down.

The second though, bullet, was more impressibly acknowledged by participants and that there seemed to be a common theme by everybody that there needs to be undervoltage load shedding; that you need target load centres because that's where the localized problem will occur and that's where you want to stump the problem before it expands and it must be automatic operation. It was noted that typically even the best operators will probably take fifteen or twenty minutes to make a decision that they are going to shed load manually. And some of these circumstances that occurred took time less than that; in fact, you know, the latter parts of it were seconds instead of minutes in measurement.

And the difficulty in all of that are that the automatic schemes are there for the protection and it's proposed that the undervoltage load shedding be both secure as well as automatic. And a secure nature related to the natural inhibition for our industry to shed load. And that relates to, let's make sure that you use all three phases, one to the voltage and that you have a secure operating redundant relays and so forth. But still put it in place and have it available for this. Next scheme please.

The opportunities for new technologies; there was material

presented for the opportunity put in, fast acting reactive devices whether they be the (inaudible) that short out sections of them quickly and they can unshort them so that they can respond. Notably when under-frequency operation occurred in this event, then the locations were, that occurred very dramatically, voltage also was dramatically impacted and reactive devices that were on line suddenly reacted in the voltage being too high. So there's a coordination between voltage and frequency operation of the schemes and the need for fast acting reactive devices including, there was even references to very new technologies like super conducting, synchronous condensers and so forth.

On line frequency monitoring and analysis was a presentation made by (inaudible) Chris Rosso (ph), indication that, let's be aware of the frequency, let's do some analysis. There was some interesting observations that he made and there was some controversy as to what were the conclusions from that as it was presented and we look forward to possibly other discussions along the line of looking at (inaudible) transformers of the frequency as well as the timing of frequency excursions on the system and so forth.

The combined measurements in a wide area control scheme were also addressed, the fact that you can't just take one element, you can't just take frequency, you just can't take your local voltage, you've got to look at a more wider area in this scheme to be able to predict what is going on because of the intricacy and complication of the system. It's all tied together and we need to recognize that the systems are different, that was a common theme. There is no one solution that you can apply universally, homogeneously across the system. There needs to be a regional effort toward that effect. Next slide please.

The quality of the diagnostic data, very quickly, need for synchronization, high. As a participant in the fact finding team, I was too intimately involved with spending a lot of time trying to resynchronize things to get that, and the technology's available, it just needs to be done. More

convenient method for consolidating the information, collecting it, archiving it, it was kind of obvious that we as an industry are not prepared to do that sort of thing for the next investigation or a routine investigations that need to be and a need for a combination of types of diagnostic material; better coverage in the different areas.

We had some areas for which we had one recorder that had to cover an area as large as what Ontario covers with twelve recorders. And that's a need as well as a mixture of both short, medium and long range recording types, the DFR's shoot for about one and a half seconds, that's good but sometimes we need a thirty second or a one minute time frame of very fast recorded data and of course, the long range recording that is time synchronized from the (inaudible) systems and so forth, five second, two second, fifteen second top recording as well as the fact it needs to be digital medium instead of the paper medium.

I've done a little bit of digitizing myself as I tried to do some analysis. I know others have done the same thing from paper copy type of (inaudible) and things in it that could have been avoided. Next slide is the conclusion here. Of course I will co-facilitate Tom Weedman, the breakout session on technology. It is in, as pointed out, pier 8. We'll be covering these topics, protection and control, event recording and analysis, special protection schemes and any emergent technologies or techniques that might be applicable to that. I invite you to attend. Thank you.

Gerry Cauley: Okay, we're a little behind but we're a little ahead too because Tom had planned very generously a forty-five minute break and I don't plan to give you a forty-five minute break. I would like to take just a few minutes. What we've done is try to bring you up to speed with what happened in Philadelphia as well as some of the thinking of the investigation team leads in terms of technical recommendations and before we go to the breakouts, are there any questions or comments that you would have on what you've heard? You'll have a chance to unload in the breakout room in lots of detail but any clarifying questions or anything you heard that kind of struck you the wrong way. If you could come to the mike because they're recording this for transcription.

Question: I'm Greg Hader (ph). I've heard very little in terms of reserve on line and spinning reserve. Are those old fashioned terms?

Gerry Cauley: I'm sure the operations group will take that on. Dave, do you want to respond to that?

Dave Hilt: Well yeah, and I think Frank Macedo brought that up as well.
I think he did bring that up with regards to the planning side and operational planning in particular. And yes, in terms of reserves and operating reserves both from a reactive and a real standpoint has come up and I think is a very good topic to discuss here as well because there was some discussion, you know, in Philadelphia and there has been some discussion around the investigation that, we need to be looking at reserves on more than just the wide area scale in terms of the entire interconnection or an entire region. We actually need to be looking at reserves in a local area.

I think Frank was bringing that up, discussing the need to have reserves in a defined geographic area, a large metropolitan area for example and have the ability, the operator needs to have that ability to manage the system going into the day, into the real time, into the moment before him. He needs to know that he has resources on the other side of a constraint on the system for example to manage that constraint and that's something that we think, you know, that has come up and that people do believe that we need to look at and address. So certainly bring it up in your sessions.

Question: Yeah, Robert (inaudible). I'm a NERC (inaudible), registered
(inaudible) body member and I did have comments about the blackout in both the New York Times and the Wall Street Journal earlier. What was unique about this event was over frequency and I was surprised not to hear about that but I think we're talking about two hundred and fifty millihertz, especially during the cascading period. There was a very nice ten minute recovery, very classic NERC ten minute recovery but I'm surprised not to hear much about the fact that this was uniquely for the first time, an over frequency and I think there are explanations for that. I won't get into that now but go into the breakout group.

Gerry Cauley: Okay, yeah, I think the investigation team is aware of under
and over frequency conditions in some of the islands. Did you have any comment? Yeah, in the back.

Question: I just wanted clarification because of the breakout session,
for example, coordination, voltage coordination, there is a problem of tuning the devices or there is a problem of setting the set points on those devices. Where should we go, again, where do these two things meet? For example, you were talking about coordinating (inaudible) power plants in a coordinated way. That means changing their set points rather than changing the logic. Which

breakout session does that belong to? Like you know, in EDF you have the pilot point base control and things like that that we should be talking about. Which session is that?

Gerry Cauley: Yeah, session three with Frank Macedo. Any other quick questions or comments?

Question: Just for clarification, sorry, (inaudible), Hydro One. A bit embarrassing cause I'm going to ask one of my staff what he's going to do. Frank Macedo, I should totally have known this but part of the title for three was, the first word was assets. Now everything you talked about Frank did not really cover the assets themselves. For instance, we heard one of the key reasons for the blackout was tree trimming, just the state of the assets. Is that to be covered in three even though you didn't really mention that?

Frank Macedo: Thanks. Yeah, obviously, panel three will cover assets. (Inaudible) of assets, tree trimming, all of that. I tried to limit mine to two sort of key issues but certainly that'll be covered.

Gerry Cauley: Okay, anything else?

Question: Ray Curshaw (ph) from International Transmission Company. I brought this up in Philadelphia and I'll bring it up again. The building of new transmission really hasn't been discussed much and we are going to send comments on the 12th and one thing we dug up was a presidential quote from George Bush, he promised the people of Ohio that the Federal Government would assist in getting them new transmission built. So I don't know if the prime minister of Canada said anything. (Laughter).

Gerry Cauley: Okay, what we're going to do is we're going to move into a break and we're going to move directly to our breakout rooms. I would encourage you to do a couple of things. This is the end of the information phase of the day. The rest of the day is meant to receive your input. Now the facilitators can like pull teeth and try to get stuff out of you but really the breakouts are for you to talk and provide inputs into the investigations development of recommendations. So please, don't be bashful, don't be a wildflower that just sits back and watches what's going on. The point of today is to get your ideas on solutions to prevent future blackouts and to minimize their impact.

So please help the facilitator by being outspoken and

don't expect them to spoon feed information to you or regurgitate more information and make presentations. It's your chance to talk. Their job is to facilitate that, make sure you stay in the same, in the right ballpark in terms of issues and topics and to make sure that you come back after the breakout with a well thought out set of solutions and recommendations that you can present to the plenary session. We're going to convene the breakouts at 10:30 so you have about a fifteen or twenty break.

I'd like to get a quick show of hands, who thinks they want to go to the reliability coordinator operations type activities in pier 3 which will be back over there. Okay, that's quite a good crowd. Who would like to go to the control centre tools and systems and that kind of stuff? Okay, that's a manageable group. The third one on planning and design and system studies. Okay, that's also going to be a big one. And what about the protection, controls. Okay, I don't think we need, we may just need a few more chairs in one and three but we'll check out when we get there. The fourth group is in pier 8 which is very, go down here to the end and go left. It's the very end of the hall, as far as you can walk.

I would mention that lunch will be set up as a buffet right out here. There's no need to stop working until 1:15 because lunch is set up as a sandwich buffet. You just walk up and grab your sandwich and finger foods, put it on a plate. You can work, take it back to your breakout room and continue working. We will reconvene here at 1:15 and we will expect each group to have a short, twenty to thirty minute presentation on their results. And we'll see you back here then.